

CLAIMS

1. (currently amended) A method for code-tracking in a CDMA communication system, the method comprising:

(a) receiving an electromagnetic signal (10) comprising a superposition of a plurality of signal components of different signal paths corresponding to a particular transmitted user signal that was spread with a particular code sequence,

(b) digitizing (14) ~~the received~~ a signal (10,13) derived from the electromagnetic signal,

(c) distributing the digitised signal (15) to a plurality of receiver fingers (1, 2, ... N) of a rake receiver, each finger being assigned to a different one of the signal paths,

(d) distributing the digitised signal (110, 111) in each finger to a detection stream branch and a synchronizing stream branch,

(e) decorrelating (121, 122) the digitised signal in a first finger of the rake receiver corresponding to a first signal path using the particular code sequence (112) in the synchronizing stream branch to generate a first decorrelated signal for the first signal path corresponding to the first finger, and

(f) reducing the interference of at least one other signal component of at least one other signal path corresponding to at least one other finger of the rake receiver with the signal component of the first signal path corresponding to the first finger by:

calculating the interference contribution of the at least one other finger in the first finger; and

subtracting, for the first signal path, the interference contribution of the at least one other finger from an intermediate signal ~~derived from~~ based on the first decorrelated signal to produce an interference reduced signal.

2. (previously presented) A method according to claim 1, wherein step (f) further comprises the steps of:

storing an S-curve for the CDMA communication system in an interference computation module; and

calculating the interference contribution of the at least one other finger in the first finger by multiplying a total weight of an interfering path corresponding to the at least one other finger by the S-curve at an estimated correct location.

3. (previously presented) A method according to claim 1 wherein the subtracting takes place on symbol rate (1/T).

4. (currently amended) A method according to claim 1, wherein interference of other signal components ($j \neq i$) than the first signal component (i) is reduced in all of the receiver fingers (1, 2, ... N).

5. (currently amended) A method according to claim 1, wherein: the code sequence is a complex-conjugate pseudo-noise code sequence; and step e) comprises decorrelating (121, 122) the digitised signal by multiplying the digitised signal with $[[a]]$ the complex-conjugate pseudo-noise code sequence (112).

6. (canceled)

7. (currently amended) A method according to claim 1, wherein comprising determining after step f) the real part (118, x) of the interference reduced ~~complex~~ signal (y) ~~is determined (126)~~.

1 8. (currently amended) A method according to claim 1 wherein comprising determining
2 before step f) the real part (\Re) of the complex interference reduced signal (116, y) is determined.

1 9. (currently amended) A method according to claim 1, wherein comprising filtering after
2 step f) the interference reduced signal (118, X) is filtered in a further step.

1 10. (currently amended) A method according claim 9, wherein steps e), f) and the filtering
2 step provide code-tracking (101) of the digitised signal (111).

1 11. (currently amended) A method according to claim 10, wherein the code-tracking (101)
2 provides an estimated timing delay ($\tau_k^{(m)}$) of the signal component of the first signal path (i).

1 12. (currently amended) A method according to claim 1 wherein prior to step f) step e)
2 comprises distributing the digitised signal (111) is distributed to a first and second correlator (121, 122).

1 13. (currently amended) A method according claim 12, wherein comprising time-shifting
2 the digitised signal (111) is time-shifted prior to feeding it to the second correlator (122) providing late
3 and early estimates (113, 114) as output of the first and second correlators (121, 122) respectively,
4 wherein one of the late and early estimates is the first decorrelated signal.

1 14. (currently amended) A method according to claim 13, wherein comprising subtracting
2 the early and late estimates are subtracted (124) yielding a difference signal.

1 15. (currently amended) A method according to claim 14, wherein comprising multiplying
2 the difference signal is multiplied with reconstructed transmitted symbols (115) to generate the
3 intermediate signal.

1 16. (canceled)

1 17. (currently amended) A rake receiver (17) according claim 26, wherein the interference
2 reduction device (131) comprises an interference computation module (132) being adapted to receive
3 complex path weights ($\tau_k^{(m)}$) and path delays ($\tau_k^{(m)}, -\tau_k^{(m)}$) to compute the interference contribution of the at
4 least one other signal component with the said signal component of the first signal path.

1 18. (canceled)

1 19. (currently amended) A rake receiver (17) according to claim 26, comprising an
2 A/D-converter (14) upstream of the receiver fingers (1, 2 ... N), for digitizing the received signal (10, 13)
3 derived from the electromagnetic signal.

1 20. (currently amended) A rake receiver (17) according to claim 26, wherein the timing
2 error detector (102) is an early-late gate timing error detector further comprising a second correlator
3 adapted to decorrelate another version (123) of the digitized signal to generate a second decorrelated
4 signal, wherein the intermediate signal is generated based on the two decorrelated signals.

1 21-23. (canceled)

1 24. (currently amended) A rake receiver (17) according to claim 26, wherein the timing
2 error detector (102) is adapted to provide pseudo-noise (112) decorrelation (121, 122).

1 25. (currently amended) A rake receiver (17) according to claim 26, ~~which~~ wherein the rake
2 receiver is adapted for direct-sequence code-division multiple access communication.

1 26. (currently amended) A rake receiver (17) for processing a digitized signal (15)
2 corresponding to a received electromagnetic signal (10) comprising a superposition of a plurality of
3 signal components of different signal paths corresponding to a ~~particular~~ transmitted user signal that was
4 spread with a ~~particular~~ code sequence, the rake receiver comprising a plurality of fingers, wherein a first
5 finger is adapted to process a signal component corresponding to a first signal path, wherein the first
6 finger comprises:

7 a detection path adapted to receive and process a first version (110) of the digitized signal; and
8 a code-tracking loop (101) adapted to receive and process a second version (111) of the digitized
9 signal to determine a path delay error for the signal component corresponding to the first signal path,
10 wherein the code-tracking loop comprises:

11 a timing error detector (102) adapted to generate error signals based on the second
12 version of the digitized signal; and

13 a loop filter (103) adapted to filter the error signals from the timing error detector to
14 generate the path delay error, wherein the timing error detector comprises:

15 a correlator (121) adapted to decorrelate the second version of the digitized
16 signal using the ~~particular~~ code sequence to generate a decorrelated signal (113);

17 an interference reduction device (131) adapted to reduce the interference of at
18 least one other signal component of at least one other signal path corresponding to at least one other
19 finger of the rake receiver with the signal component of the first signal path corresponding to the first
20 finger by:

21 calculating (132) the interference contribution of the at least one other
22 finger in the first finger; and

23 subtracting (130), for the first signal path, the interference contribution
24 of the at least one other finger from an intermediate signal (116) ~~derived from~~ based on the first
25 decorrelated signal.

1 27. (currently amended) A rake receiver according to claim 26, wherein the interference
2 reduction device is adapted to:

3 store an S-curve for ~~the~~ a CDMA communication system; and

4 calculate the interference contribution of the at least one other finger in the first finger by
5 multiplying a total weight of an interfering path corresponding to the at least one other finger by the
6 S-curve at an estimated correct location.

1 28. (currently amended) A method according claim 1, wherein step (f) comprises using
2 complex path weights ($c_k^{(n)}$) and path delays ($\tau_k^{(n)}, \tau_k^{(n)}$) to compute the interference contribution of the at
3 least one other signal component with the signal component of the first signal path.

1 29. (currently amended) Apparatus for code-tracking in a CDMA communication system,
2 the apparatus comprising:

3 means for receiving an electromagnetic signal (10) comprising a superposition of a plurality of
4 signal components of different signal paths corresponding to a ~~particular~~ transmitted user signal that was
5 spread with a ~~particular~~ code sequence;

6 means for digitizing (14) ~~the received~~ a signal (10,13) derived from the electromagnetic signal;

7 means for distributing the digitised signal (15) to a plurality of receiver fingers (1, 2, ... N) of a
8 rake receiver, each finger being assigned to a different one of the signal paths;

9 means for distributing the digitised signal (110, 111) in each finger to a detection stream branch
10 and a synchronizing stream branch;

11 means for decorrelating (~~121, 122~~) the digitised signal in a first finger of the rake receiver
12 corresponding to a first signal path using the ~~particular~~ code sequence (112) in the synchronizing ~~stream~~
13 ~~branch~~ to generate a first decorrelated signal for the first signal path corresponding to the first finger, and
14 means for reducing the interference of at least one other signal component of at least one other
15 signal path corresponding to at least one other finger of the rake receiver with the signal component of
16 the first signal path corresponding to the first finger by:
17 calculating the interference contribution of the at least one other finger in the first finger;
18 and
19 subtracting, for the first signal path, the interference contribution of the at least one other
20 finger from an intermediate signal ~~derived from~~ based on the first decorrelated signal.

1 30. (currently amended) An apparatus according to claim ~~[[27]]~~ 29, wherein the means for
2 reducing interference ~~reducing means~~ comprises:

3 means for storing an S-curve for the CDMA communication system in an interference
4 computation module; and

5 means for calculating the interference contribution of the at least one other finger in the first
6 finger by multiplying a total weight of an interfering path corresponding to the at least one other finger
7 by the S-curve at an estimated correct location.

1 31. (currently amended) An apparatus according claim ~~[[27]]~~ 29, wherein the means for
2 reducing interference ~~reducing means~~ comprises means for using complex path weights ($\tau_k^{(w)}$) and path
3 delays ($\tau_k^{(w)}$, $\tau_k^{(w)}$) to compute the interference contribution of the at least one other signal component with
4 the signal component of the first signal path.